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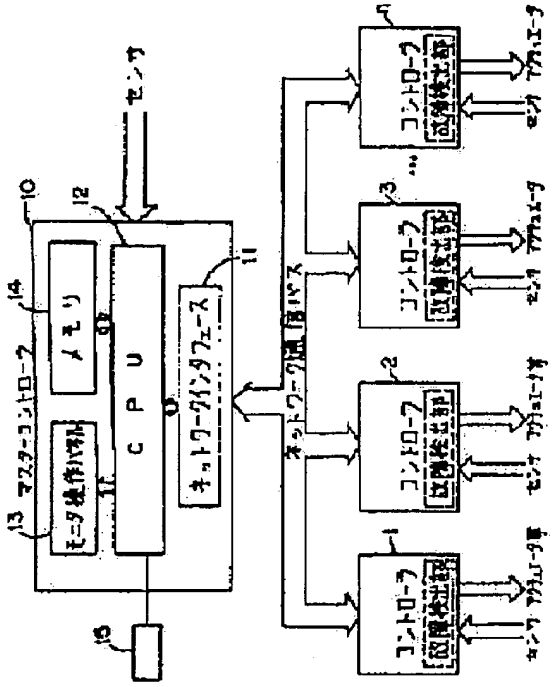
Title of invention: FAULT MANAGING DEVICE FOR VEHICLE
Abstract:

PURPOSE: To offer a fault managing device for a vehicle where maintenance time is shortened and efficiency is improved by easily discovering even fault whose cause is difficult to be investigated in a short time.

CONSTITUTION: By this invention, plural controllers 1-n which are connected with a sensor or an actuator is connected with the master controller 10 through a communication network, the respective controllers 1-n detect the fault of the sensor or the actuator which they are in charge of and are provided with fault detecting devices which transmit fault data indicating respective fault items. And the master controller 10 is provided with a timer means counting, the passing of time from the reception of fault data from the respective controllers 1-n, a memory 14 store-remembering fault information which adds the respective fault items from the respective controllers 1-n and the passing of time corresponding to the fault items, a display unit displaying the fault information and an operating means 13 which gives operation indication which permits fault information storage-remembered in the memory 14 to be sequentially displayed in the display unit.



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[WHAT IS CLAIMED IS:]

[Claim 1]
Failure analysis apparatus for vehicle; wherein; Commutator network is gone through, and the plural controllers which sensor or an actuator was connected to are connected to a master controller, the sensor which each controller is in charge of or accident of an actuator is detected, after failure detection apparatus transmitting accident data to show each accident article in is comprised to each above controller, and receiving accident data from each controller, the timer measure which times *no* elapsed time, The memory which it accumulates, and store accident information including said elapsed time corresponding to each accident article from each said controller and this accident article, The annunciator which displays said accident information, Operation measure giving operation designation making said annunciator display the accident information which remembered that it accumulates in said memory sequentially is possessed to an above master controller.
[Claim 2]
Failure analysis apparatus for vehicle; according to claim 1 wherein; Evolution frequency of error is included in accident information stored by said memory.
[Claim 3]
Said master controller is comprised by monitor control panel of vehicle, it is failure analysis apparatus for vehicle as claimed in claim 1 that operation designation to make display above designation article sequentially by doing combined control of switch disposed by said monitor control panel is given or 2.

[DETAILED DESCRIPTION OF THE INVENTION]

[0001]

[INDUSTRIAL APPLICATION FIELD]
The present invention relates to failure analysis apparatus for vehicle doing accident designation of plural component of vehicle of, construction equipment, storage of accident hysteresis, monitoring.
[0002]

[PRIOR ART]
Accident designation of conventional construction equipment and diagnosis system configuration are shown in FIG. 6.
[0003]
As shown in this FIG. 6, control of construction equipment is split into plural controllers in apparatus conventionally, accident evolution of the apparatus which each controller is in charge of in each controller unit is determined, sign to show accident evolution in as against display unit of monitor control panel when accident occurred is transmitted.
[0004]

[PROBLEM TO BE SOLVED BY THE INVENTION]
For this case, Because hysteresis of accident is not taken in apparatus conventionally, when a fault occurred, T-junctions are connected to sensor of each controller and connector connection with an actuator, and operator ensures sensor and sign of an actuator (current, tension) to examine an accident possible cause, but, because it is necessary a connector is taken off once when a T-junction is used, and to connect a T-junction, there was the defect which accident of imperfect contact of connector area was hard to discover. In addition, Dead time of machine is had a long, and there is issue that loss is big for a user so that great time suffers in apparatus conventionally to pursue a possible cause.
[0005]
This invention is a thing done in view of such an actual condition, and difficult accident of possible cause investigation is directed to easy and that it can be discovered by a short time, and failure analysis apparatus for abbreviation of maintenance time and vehicle planning efficiency is provided.
[0006]

[MEANS TO SOLVE THE PROBLEM]
Commutator network is gone through, and the plural controllers which sensor or an actuator was connected to in this invention are connected to a master controller, the sensor which each controller is in charge of or accident of an actuator is detected, after failure detection apparatus transmitting accident data to show each accident article in is comprised to each controller, and receiving accident data from each controller, the operation measure which gives annunciator displaying the memory which it accumulates, and store accident information including the elapsed time corresponding to timer measure timing *no* elapsed time and each accident article from each controller and this accident article and the accident information and the memory operation designation making the annunciator display the accident information which stored accumulation sequentially is possessed to the master controller.
[0007]

[OPERATION]
According to assembling of the hanging present invention, each controller transmits accident data to show presence of the sensor which each controller is in charge of or accident evolution of an actuator in to a master controller regularly, when a master controller detects accident evolution within the accident data, accumulation stores accident information including elapsed time of accident code corresponding to the accident and the accident in memory. The accumulated accident information is displayed by the accident content at sight by annunciator, and the accumulation information is read by means of appointed operation through the operation measure sequentially, and it is displayed.
[0008]

[EXAMPLE]
This invention is explained according to embodiment shown in accompanying drawing in detail as follows.
[0009]
As for FIG. 1, this embodiment apparatus is equipped with in construction equipment of power shovel with a thing showing embodiment of this invention.
[0010]
Various sensor and actuators in construction equipment are split into one or more plural controller n, and is connected, each comprises failure detection department detecting sensor and accident of an actuator connected to the controller in each one or more controller n.
[0011]
One or more plural controller n goes through network communication bath BS, and these are connected to master controller 10. Master controller 10 comprises monitor control panel 13 and memory 14 with network interface part 11 and CPU 12, and it is configured.
[0012]
In failure detection department of each one or more controller n, various accident of a sensor and the actuator which the controller is in charge of is always detected , by way of example only, accident data as shown in FIG. 3 is transmitted to master controller 10. Accident data of FIG. 3 assumes a pump controller of power shovel shown in FIG. 2 as one controller, engine rotation sensor 20 and pressure sensor 21 is connected to a pump controller as sensor, and solenoid 22 to control hydraulic valve as an actuator is connected.
[0013]
Accident article in this pump controller forms accident data of one or more N O N O 4-4 byte by assigning these accident article to 1 bit as follows respectively.
[0014]
When accident occurred in two .2 steps travel motion *soku* reshuffling solenoid short circuit relief solenoid short circuit / minute anastomosis solenoid short circuit / swing brake solenoid short circuit / limit switch dissociation solenoid short circuit / service solenoid short circuit / two .2 steps travel motion *soku* reshuffling solenoid breaking of wire relief solenoid breaking of wire / minute anastomosis solenoid breaking of wire / swing brake solenoid breaking of wire / limit switch dissociation solenoid breaking of wire / service solenoid breaking of wire / *otodeseru* horsepower abnormality / rotation sensor abnormality / pressure sensor power fail / the second pressure sensor abnormality / the first pressure sensor abnormality / limit switch EPC solenoid breaking of wire / 2. 1. two limit switch EPC solenoid short circuit limit switch EPC solenoid short circuit TV C valve solenoid breaking of wire / two 2. two 1. one TV C valve solenoid short circuit TV C valve solenoid short circuit TV C valve solenoid

breaking of wire / one 2. one TV C valve solenoid short circuit TV C valve solenoid short circuit 1 namely a certain accident article , in each one or more controller n, accident does accident data bit corresponding to the accident article which occurred to "1", and it is transmitted to master controller 10.
[0015]
CPU 12 of master controller 10 goes through network interface 11 by using polling method, and the accident data from one or more plural controller n is received sequentially regularly, it is checked whether there is not the bit which "1 was written in at within received accident data, when there was the bit which "1 was written in at, an error code corresponding to accident article of this bit (code such as 15", 2E" which, by way of example only, is referred with each accident article of FIG. 3) is written in at memory 14. Memory 14 comprises the area that it accumulates, and store plural accident article as shown in FIG. 4 (for this case, 20 items), time data storage area storing time data to show an error code storage area storing an error code in an accident article storage area of one and elapsed time from accident evolution of coping accident article in is comprised. In addition, Now, to memory 14, a sum check data storage area storing sum check data to do an accident article number data storage area storing accident article number data to show occurring accident article number in and a sum check of the error code is had.
[0016]
When CPU 12 writes in an error code at memory 14, it checks whether the error code that is going to be written in is already written in at storage device now, only an error code to be different from the error code that is already written in at memory 14, of memory 14, it is stored newly in a storage area. In addition, An error code is written in at the order that occurred accident in accident article storage area 1-20 for 20 items of the whole memory 14 in a point, if a storage area of 20 items becomes full, accident data corresponding to the accident which is most old is updated in accident data corresponding to the accident which is most new.
[0017]
In addition, When CPU 12 writes in an error code at memory 14, time data storage area of an area to write in is inisyaraizushi, and it is zeroed, and time count action is started from the event which the error code was written in at, whenever appointed time (for one hour, for example) passes, elapsed time to it is written in at time data storage area. Of course, When plural faults occur in parallel, CPU 12 counts elapsed time every each accident. In this way, An accident topic occurring in each one or more controller n and the elapsed time accumulate, and, to memory 14, it is stored then.
[0018]
In addition, CPU 12 sounds alarm buzzer 15 to indicate the action that is requirement in operator about the accident article which is the crucial which seems to be connected in malfunction and break-down of machine (the accident article which ™ of FIG. 3, for example, is referred to), and error codes are displayed in display of monitor control panel 13. By way of example only, In that case of short circuit of swing brake, disconnection, it "is E": An error code such as for example 03 (the denotation that switch) enabling revolving redundancy switch (revolving please be put in) is displayed.
[0019]
The above is action when centralized control, storage, an emergency display accident article.
[0020]
Accident hysteresis reference mode is described according to flow chart of FIG. 5 to pour.
[0021]
Eight one or more switch S W S W 8 is installed in monitor control panel 13 as shown in FIG. 2, S W 1 is master switch.
[0022]
When these one or more switch S W S W 8 is not spent all, a current time of day is displayed in display of a monitor control panel (watch designation mode, step 130).
[0023]
And, When our master switch S W 1 and S W 2 of one or more switch S W S W 8 of 8 continue being pushed in coincidence more than three seconds, it shifts in accident hysteresis designation mode, at first an error code of accident entry number 1 in memory 14 and the elapsed time are displayed. In addition, If, in this accident hysteresis mode, the number of the accident article in memory 14 is zero, "accident nothing" is displayed in display. In addition, When plural faults occur, when is turned on master switch S W 1 and switch S W 3 after this by coincidence, an error code of the next accident entry number and the elapsed time are displayed. As follows, An error code of the next accident entry number and the elapsed time are displayed sequentially by turning on master switch S W 1 and switch S W 3 at the same

time sequentially (accident hysteresis designation mode, step 120, 140-190).
[0024]
In addition, When when it was cleared, keyswitch of vehicle was passed to all the accident hysteresis memorized to memory 14, master switch S W 1 continues being pushed more than five seconds (accident hysteresis clearing mode, step 100-110).
[0025]
In addition, After keyswitch of vehicle was turned to the watch designation mode and accident hysteresis designation mode, it is done action. In addition, In accident hysteresis designation mode, it is done with master switch S W 1 and coincidence operation of S W 4 in case returning an accident entry number (it is displayed in inverse order).
[0026]
Even more particularly, In apparatus, it can make monitor control panel 13 display car body information such as engine number of revolutions or pressure sensor output voltage. In other words, When master switch S W 1 and S W 5 continue being pushed at the same time more than three seconds, it shifts in car body information display mode, it can make display the car body information which operator specified optionally.
[0027]
In other words, Become input each car body information such as engine number of revolutions or pressure sensor output voltage other than the accident article by each one or more controller n, a master controller transmits this entry number to car body information display mode as against a controller in charge of car body information of an entry number specified by means of operator (it is broken, and an entry number is followed every car body information) by means of master switch S W 1 and coincidence operation of S W 4 when it shifts. The controller which received this entry number sends back car body information corresponding to a received entry number to master controller 10. Master controller 10 displays received car body information in annunciator of monitor control panel 13.
[0028]
In addition, When operator specifies an entry number of car body information, same as the accident information, master switch S W 1 and coincidence of S W 3 are operated to push forward the entry number, master switch S W 1 and coincidence of S W 4 are operated to return an entry number. Because this car body information display mode runs side by side with operation of a normal mode switch of construction equipment (activity mode, travel motion mode) and is possible, while watching car body information, activity mode can be changed, check time of car body information is shortened, and easy can ensure alteration of the car body information which is transient in activity mode alteration.
[0029]
In addition, Network bath is gone through, and, in the embodiment, master controller 10 and one or more plural controller n are connected, but, one serial communication circuit is gone through, and it may be connected. In addition, Function operating the evolution frequency every accident article is given master controller 10, it may make it makes the accident frequency which operated cope with accident article, and memory 14 store. In addition, In the embodiment, time data storage area is updated every appointed time, but, a this time data storage area may be always updated.
[0030]

[EFFECT OF THE INVENTION]
As discussed above, according to this invention, it is connected in network mainly on a master controller between each controllers, because accident hysteresis of each controller was caught with a master controller, difficult accident of possible cause investigation can be discovered by easy and a short time, abbreviation of maintenance time and efficiency get possible to be planned.

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[BRIEF DESCRIPTION OF DRAWINGS]

[FIG. 1]
It is a block diagram showing embodiment assembling of invention.
[FIG. 2]
It is figure showing an example of a controller.
[FIG. 3]
It is figure illustrating accident data.

[FIG. 4]
It is figure showing a storage aspect of memory.
[FIG. 5]
It is flow chart showing action example of cf. accident hysteresis mode.
[FIG. 6]
It is figure showing apparatus conventionally.
[DENOTATION OF REFERENCE NUMERALS]
One or more n ... controllers Ten ... master controllers 11 ... network interface 12 ... CPU 13 ... monitor control panels 14 ... memory 15 ... alarm buzzer